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(54) IMPROVEMENTS IN OR RELATING TO
THE INJECTION MOULDING OF DECORATED
PLASTICS ARTICLES

(71) We, DIALENE INTERNATIONAL LIMITED, a British Company, of 8 Coombe Road, London NW10, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to the moulding of articles in plastics materials, and in particular to methods of moulding of a plastics article having a decorated outer surface, as well as to articles produced by such methods.

Injection moulding techniques are used for the manufacture of a wide variety of plastics articles in the consumer goods field, and it is common practice to apply to such articles a form of decoration. One possible way of doing this is to adhere on the outer surface of the article individual, decorative parts—and though this may have certain aesthetic attractions, it certainly is not really commercially viable for mass-produced articles. Another possibility is to mould around the outside of the article the decorations themselves, though it is found that it is not always possible to obtain satisfactory adhesion between the decoration and the article proper especially when the decoration is in relief and in contrast with the major part of the article, for the materials used may not be wholly compatible. One particularly good solution to this problem is to arrange for all of the decorations to be interconnected such that conjoined decorations are formed continuously around the outside of the article and in this way a sufficiently high degree of adhesion can be obtained—but not always are conjoined decorations required.

It is a principle aim of this invention to provide a method of manufacturing a moulded plastics article carrying a decoration which may comprise discrete de-

corative elements provided on the wall(s) thereof.

According to this invention, there is provided a process for the moulding of a decorated plastics article comprising injection moulding in a first mould a hollow, first part of the article with holes formed through the wall(s) of the first part, removing the moulded first part from the first mould and inserting the first part into a second mould arranged to fit generally closely around the first part but defining in conjunction with the first part cavities corresponding to the required decoration, the first part being inserted into the second mould such that the said holes formed in the first part communicate with the said cavities, injection moulding a second part within the first part such that the second part forms an internal lining for the wall(s) of the first part but also extends through the said holes formed therein to fill the said cavities thereby to provide decoration corresponding to said cavities on the outer surface of the first part, and then removing the composite, two-part decorated moulded article from the second mould.

The said cavities will normally be defined by depressions formed in the surface of the second mould which otherwise contacts the outer surface of the first part of the article, so as to form decoration in relief on the outer surface of the first part. It would, however, be possible to mould the first part so as to have areas lying somewhat sub-flush and the second mould then being uniform but defining with said areas the cavities. The finished article would in this case have a smooth outer surface, but if the two parts are moulded with different coloured or textured materials, the decoration will still be apparent.

For the case of depressions in the second mould, it will be appreciated that if the depressions are not contiguous—that is,

when the first part is inserted into the second mould, each depression is separate from the others—the decoration in relief resulting on the outer surface of the first part will comprise discrete elements of the second part. These discrete portions are however held firmly in position by virtue of the material of the second part extending through the holes in the first part, thereby joining the relief decoration with the lining and securely holding the decoration in position. Depending upon the materials used in the moulding processes, there may also be a degree of adhesion between the second part and the first part, assisting the mechanical fixing of the decoration, but this is not essential, and so the materials of the first and second parts need not be wholly compatible.

Using the method of this invention, it is found to be possible to use relatively low injection pressures when moulding the second part, which leads to a reduction in flashing normally associated with the injection moulding of plastics articles. A further advantage is that since each decorative element on the outside is self-gating (i.e. the plastics material is fed directly to each decorative element) there is a further reduction in flashing. Each decorative element is moulded directly, and access for moulding can be had to as many decorative elements as are required in the design of the article. Also, as mentioned above, materials which previously had been regarded as non-compatible can, in some circumstances, be used.

In a preferred process of this invention, the colour of the plastics material used for moulding the second part is of a contrasting colour with that used for the first part, such that the decoration on the surface of the first part contrasts with, as well as upstands from, the surface of the first part. If the decoration is to appear in more than one colour, it would be possible to blank off a portion of the second part during an initial moulding step for the second part using one colour material, and then to complete the moulding of the second part by removing the blanking and injecting a material of a second colour into the portion which previously was blanked-off.

The moulding process of this invention may be conducted with most thermoplastics and thermosetting materials, suitably coloured, which are employed in injection moulding processes, and particularly polystyrene and polyethylene.

It is clearly most important that the holes formed through the wall(s) first part communicate with the depressions formed in the second mould prior to the moulding of the second part within the first part. To this end, it is preferred for the first part to

be moulded with a positioning index, which index can be aligned with another provided in or on the second mould itself. Conveniently, the index can comprise an upstanding projection (or a depression) engageable with a depression (or an upstanding lug respectively) of the second mould, so as to ensure the correct register between the moulded first part and the second mould.

Though normally it is envisaged that the first part will by itself provide the general overall shape of the complete, two-part moulded article, the second part serving principally to provide an internal lining for the first part as well as the decoration on the outside surface, the second part may, if desired, form an integral, essential portion of the completed article other than the internal lining of the first part and the external decoration. For example, in the case of the moulding of a bowl, the first part may comprise solely the side wall, and the second part may provide the decoration on the outside surface of the side wall, a lining on the inside of the side wall and the sole base to the bowl. In this case, the plastics material for the second part may be injected into the second mould from below the base (of the bowl), such that gating marks occurring at the injection point will be on the underside of the finished article and thus will not immediately be apparent from a consideration of the article when standing on a surface. This of course is applicable to all types of container somewhat similar to bowls.

Though in general the second part will form a lining over the whole of the interior of the first part, this is not essential; as long as there is a lining in the region of the holes in the first part material will be supplied through the holes to the decoration and the decoration should be sufficiently well fastened to the first part. Thus, the second part could overlie only the side wall(s) of the first part, or even only that portion of the side wall(s) as support the decoration.

A further possibility is for the second mould to have depressions (or engravings) in it not registering with the holes in the first part when moulded. In the moulding step for forming the second part, the heat and pressure of the moulding operation can urge the moulded first part into the depressions (or engravings) in the second mould; in this way a pattern in relief can be formed in the colour of the first part in addition to the decoration formed by the second part.

This invention extends to articles whenever made by a moulding process of this invention.

By way of example only, one specific

embodiment of a moulding process of this invention will now be described, reference being made to the accompanying drawings, in which:—

5 Figure 1 is a cross-section through a mould used for the moulding of a first part of a two-part composite moulded article;

10 Figure 2 is a cross-section through the first part of the article moulded in the mould of Figure 1;

Figure 3 is a cross-section through a mould used for the moulding of the second 15 part of the two-part composite moulded article; and

Figure 4 is a cross-section through a completed article moulded in accordance with a process of this invention.

20 The invention will be described referring to the moulding of a bowl with an external decoration provided in relief thereon. The article is formed in two parts, and the production process starts with the injection 25 moulding of a first part 11 in a two-piece first mould 10 (Figure 1) from a thermoplastic material such as polystyrene. As shown in Figure 2, the moulded first part 11 comprises a frusto-conical wall 12 open 30 at both ends 13 and 14 and provided with a plurality of regularly-spaced holes 15 extending laterally through the wall. Each hole 15 is circular in cross-sectional shape or any other cross-section suitable for gating the decorations and of uniform dimensions 35 along its length, and is formed by suitable projections 16 provided in the inner portion 10a of the first mould used for forming this part 11.

40 Once the moulded first part 11 has solidified in the first mould, the mould is separated and the first part is lifted away therefrom either manually or automatically and inserted into a two-piece second mould 45 17 (Figure 3) arranged to fit generally closely around the outer wall of the first part. The outer section 17a of the second mould has however depressions 18 formed therein in substantially the same array as 50 the holes 15 formed in the first part 11, each depression corresponding in shape to the shape of a decoration which is to be formed on the outer surface of the completed article—and in the present case each 55 depression 18 is of generally star-like shape. The first part 11 must be inserted into the second mould such that each hole 15 registers with a depression 18, and to this end the first part 10 is provided with 60 a suitable reference mark or index which can be aligned with a corresponding mark provided on the second mould. In the described embodiment, the first part 11 is moulded with a small recess 19 at one 65 point on its periphery by a peg 20

provided on portion 10a of the first mould. This recess 19 locates on a lug 21 disposed 70 in the inner section 17b of the second mould 17 when the holes 15 in the first part are properly aligned with the depressions 18. The lug 21 can be withdrawn or removed when alignment is completed, so as to avoid leaving the recess on the final article.

75 Once properly positioned in the second mould, the second part 22 of the composite article is moulded by a conventional injection moulding process within the first part 11, so as to form a lining 23 therein and a base 24 for the completed article. During this injection moulding 80 process, the material forming the second part passes through the holes 15 in the first part 11 so as to fill the depressions 18 in outer section 17a of the second mould, thereby providing on the outer surface of the first part 11 decorations 25 in the required pattern. The second part is also 85 shaped during the moulding operation so as to provide a basal rim 26, on which the completed article may rest when it is stood on a surface.

By forming the second part to serve as the base 24 for the completed article, the 90 second part may be moulded from below the base, such that the injection sprue 27 is on the underside of the finished article. After the second part has solidified, the second mould is separated and the article 95 is lifted out. The sprue 27 may be broken off in the usual way, and the article is then finished as necessary — for instance by knifing-off any flashing.

The moulds shown in Figures 1 and 3 100 are somewhat diagrammatic, but the manufacture of suitable moulds will be well within the ability of a person ordinarily skilled in this art. For instance, the moulds must be in section to split, so as to allow 105 removal of the moulded article, and suitable heating or cooling techniques must be used, dependent upon the materials to be moulded.

It will be appreciated from a consideration of the above that a particular 110 advantage of the moulding process of this invention is that surface decoration may be provided on the outside of a moulded plastics article, which decoration consists 115 of a plurality of discrete elements, each element being firmly attached to the article and upstanding from the general surface of the article. Furthermore, there are no connecting runners between the parts of the 120 decoration nor is there a need to provide suitable gating on the split lines of the moulds employed in the production 125 process.

WHAT WE CLAIM IS:

1. A process for the moulding of a de- 130

- corated plastics article comprising injection moulding in a first mould a hollow, first part of the article with holes formed through the wall(s) of the first part, removing the moulded first part from the first mould and inserting the first part into a second mould arranged to fit generally closely around the first part but defining in conjunction with the first part cavities corresponding to the required decoration, the first part being inserted into the second mould such that the said holes formed in the first part communicate with the said cavities, injection moulding a second part within the first part such that the second part forms an internal lining for the wall(s) of the first part but also extends through the said holes formed therein to fill the said cavities thereby to provide decoration corresponding to said cavities on the outer surface of the first part, and then removing the composite, two-part decorated moulded article from the second mould.
2. A method according to claim 1, wherein the cavities are defined by depressions formed in the surface of the second mould which otherwise contacts the outer surface of the first part of the article when the first part is inserted therein.
3. A method according to claim 2, wherein each depression is separate from the others.
4. A method according to any of the preceding claims, wherein the first part is moulded from a plastics material of one colour and the second part is moulded from a plastics material of a contrasting colour.
5. A method according to any of claims 1 to 3, wherein the second part is moulded in two steps, during the first of which a portion of the second part is blanked-off and the first moulding step is performed with one colour of plastics material, whereafter the blanking is removed and the second moulding step for the second part is performed with a plastics material of a second colour, injected into the portion which previously was blanked-off in the first step.
6. A method according to any of the preceding claims, wherein the first part is moulded with a positioning index, which index is aligned with another provided in

or on the second mould itself before the moulding of the second part.

7. A method according to claim 6, wherein the index comprises an upstanding projection or a depression engageable with a depression or an upstanding lug respectively of the second mould.

8. A method according to any of the preceding claims, wherein the second part, when moulded, forms an integral essential portion of the complete moulded article other than the internal lining of the first part and the external decoration.

9. A method according to claim 8, wherein the first part forms the sidewall of a bowl or like container, and the second part provides the decoration on the outside surface of the side wall, a lining on the inside of the side wall and the base to the bowl or like container.

10. A method according to claim 9, wherein the plastics material for the second part is injected into the second mould from below the base of the completed article, such that gating marks occurring at the injection point are on the underside of the finished moulded article.

11. A method according to any of the preceding claims, wherein the second mould has depressions or engravings in the surface which contacts the first part, which depressions or engravings do not register with the holes in the first part such that during the moulding step for forming the second part, the heat and pressure of the moulding operation urges the moulded first part into the depressions or engravings in the second mould.

12. A method according to claim 1 and substantially as hereinbefore described with reference to the accompanying drawings.

13. A moulded plastics article whenever made in accordance with a method according to any of claims 1 to 12.

14. A moulded plastics article substantially as hereinbefore described with reference to and as illustrated in Figures 2 and 4 of the accompanying drawings.

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1503039

COMPLETE SPECIFICATION

1 SHEET

*This drawing is a reproduction of
the Original on a reduced scale*

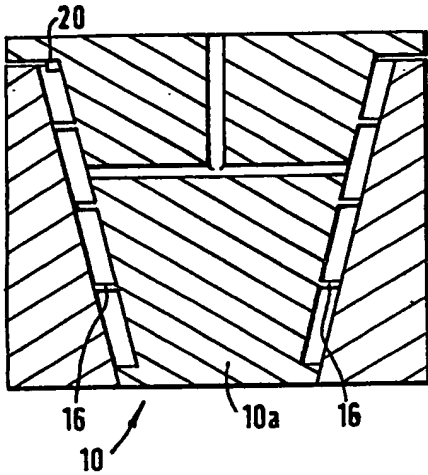


FIG. 1

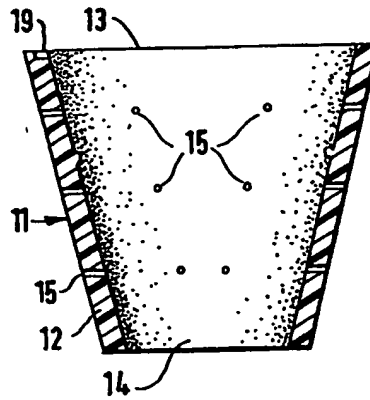


FIG. 2

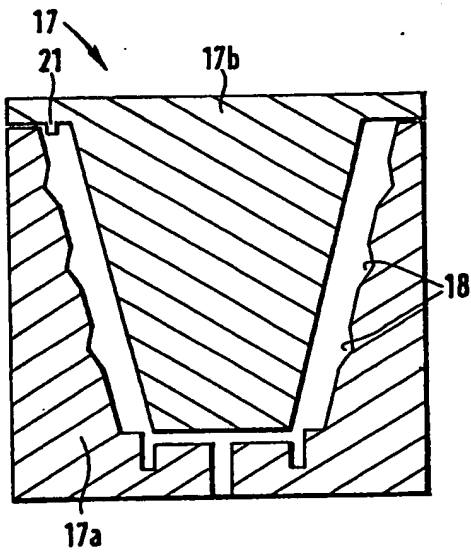


FIG. 3

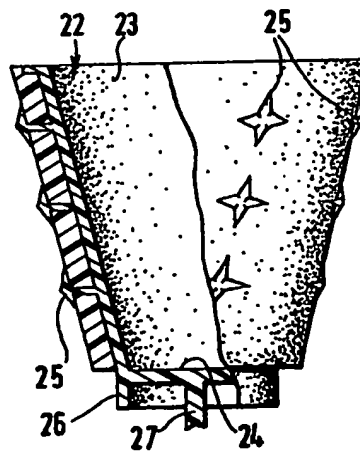


FIG. 4